Electronic Supplementary Information

Two-dimensional net-like SnO_2/ZnO heteronanostructures for high-performance H_2S gas sensor

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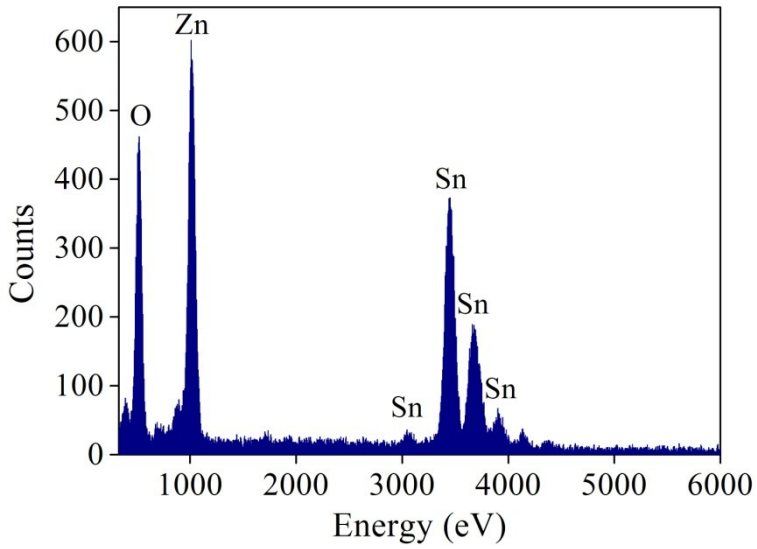

Figure S1 Typical EDX pattern of the net-like SnO_2/ZnO heteronanostructures.

Table S1 The sizes of ZnO and SnO_2 particles by the Scherrer equation

	ZnO (101) in homonanostructures	SnO_2 (110) in homonanostructrures	ZnO (101) in heteronanostructrures	SnO_2 (110) in heteronanostructrures
B (rad)	6.06×10^{-3}	19.3×10^{-3}	15.5×10^{-3}	60.5×10^{-3}
ϑ (°)	18.09	13.28	18.09	13.41
***D* (nm)**	**23.82**	**7.30**	**9.32**	**2.33**

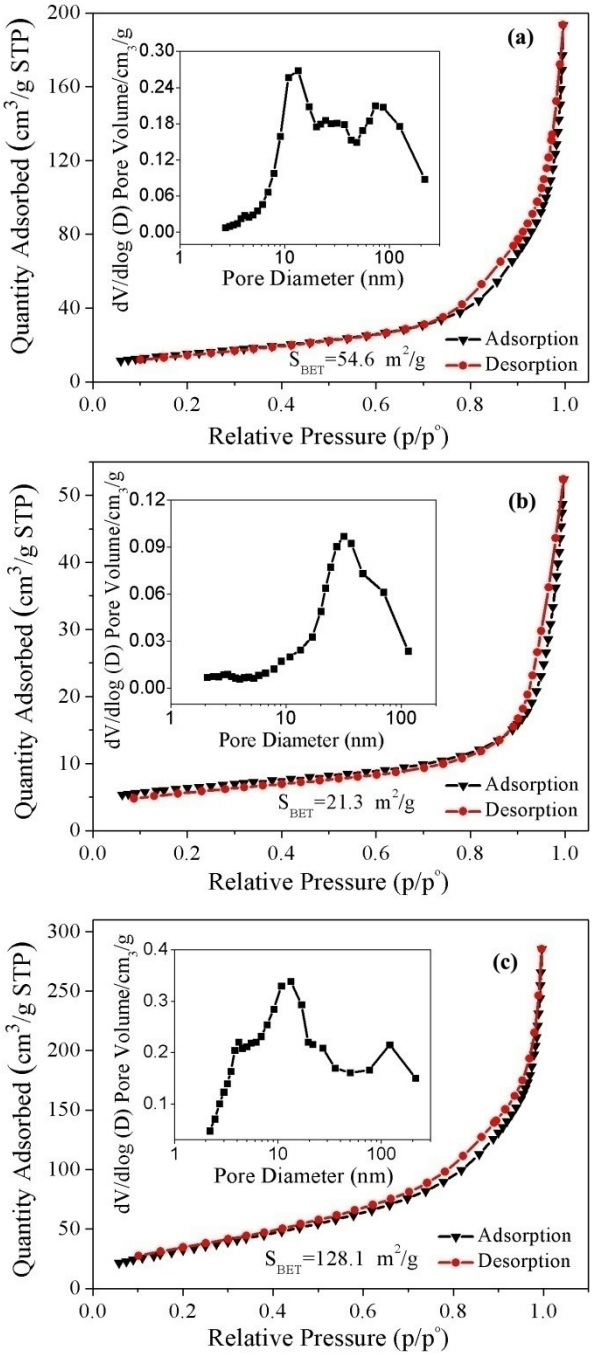

Figure S2 Nitrogen adsorption–desorption isotherms of a) SnO_2 homonanostructures, b) ZnO homonanostructures, and c) SnO_2/ZnO heteronanostructures. The insets showing the corresponding pore size distributions.

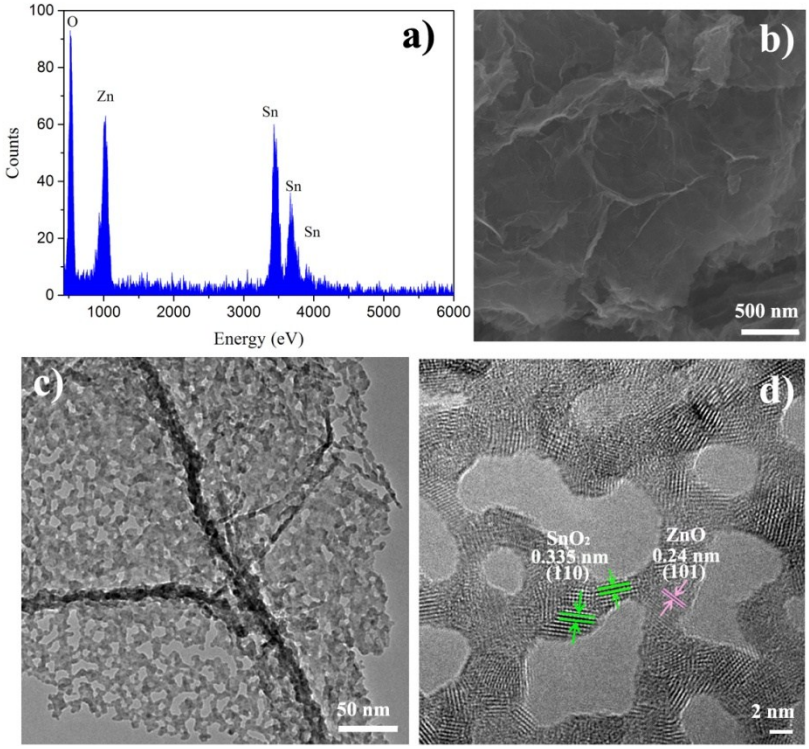

Figure S3 The structural characterizations of SZ-2.

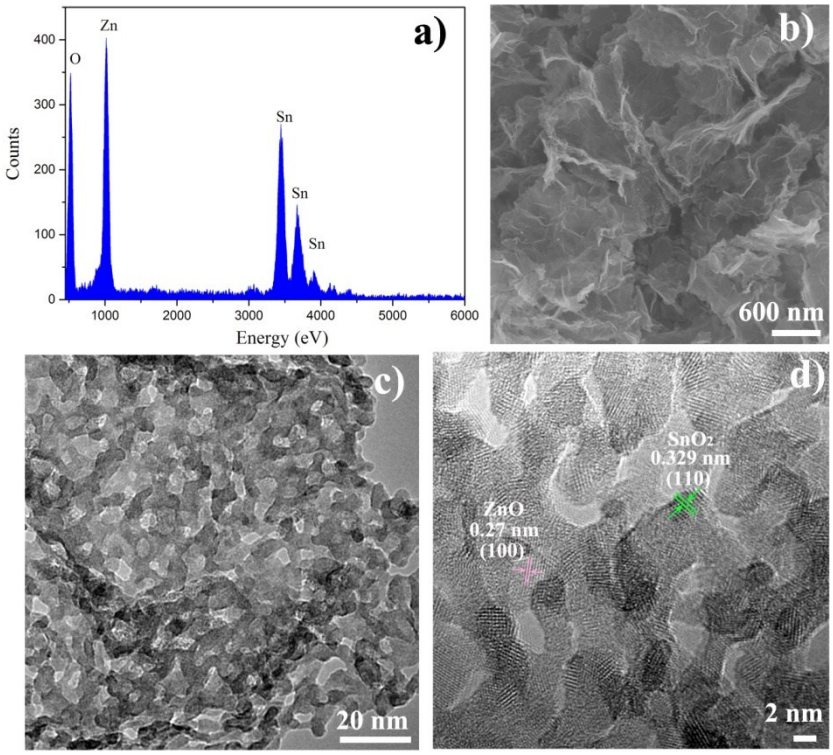

Figure S4 The structural characterizations of SZ-3.

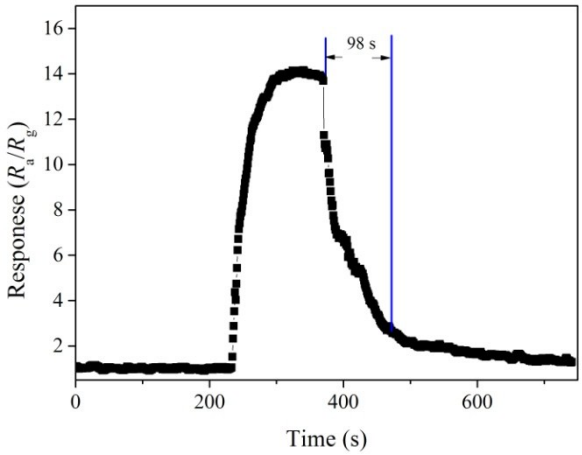

Figure S5 The sensor response of the SnO_2/ZnO heteronanostructures to 5 ppm H_2S at 180°C.

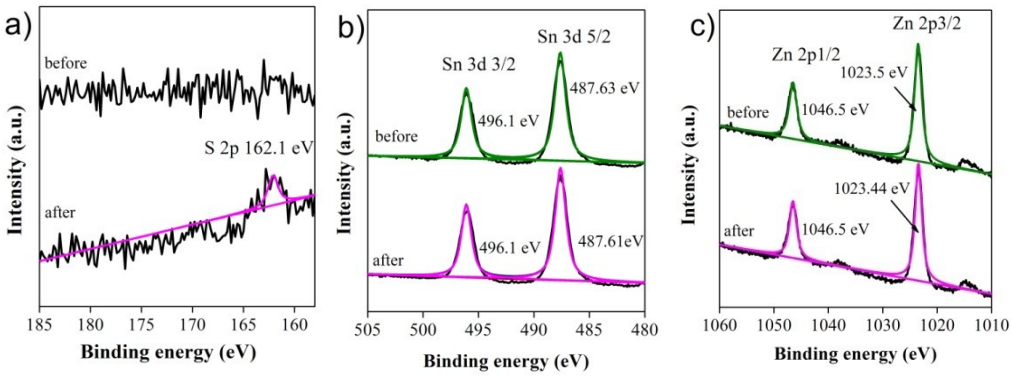

Figure S6 XPS spectra of the heteronanostructures before and after H_2S sensing test. a) S 2p, b) Sn 3d, and Zn 2p.

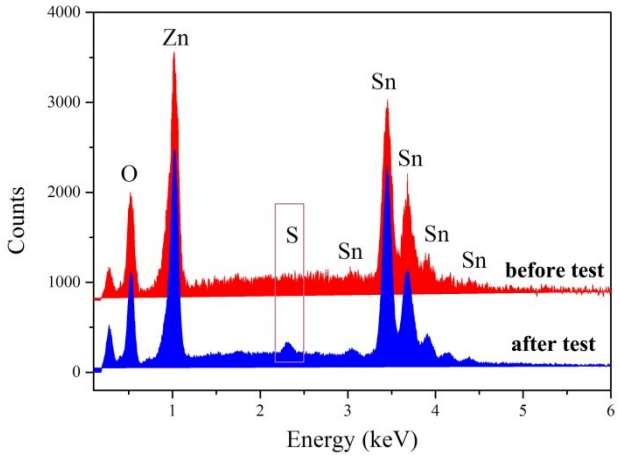

Figure S7 EDS spectra of the heteronanostructures before and after H_2S sensing test.

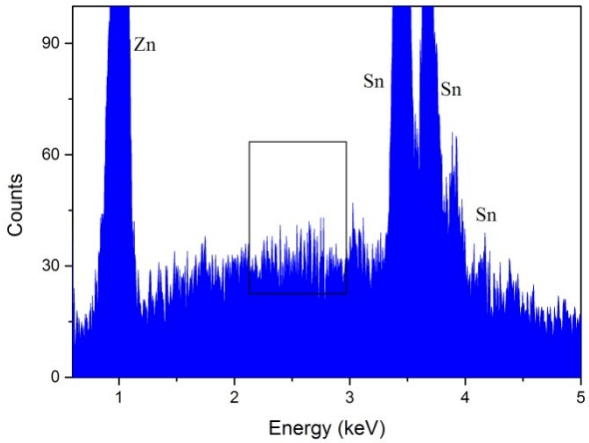

Figure S8 EDS spectra of the heteronanostructures after H_2S testing (1 ppm H_2S), and then exposing air at the working temperature of 100°C until the resistance recover to 90% of initial resistance.

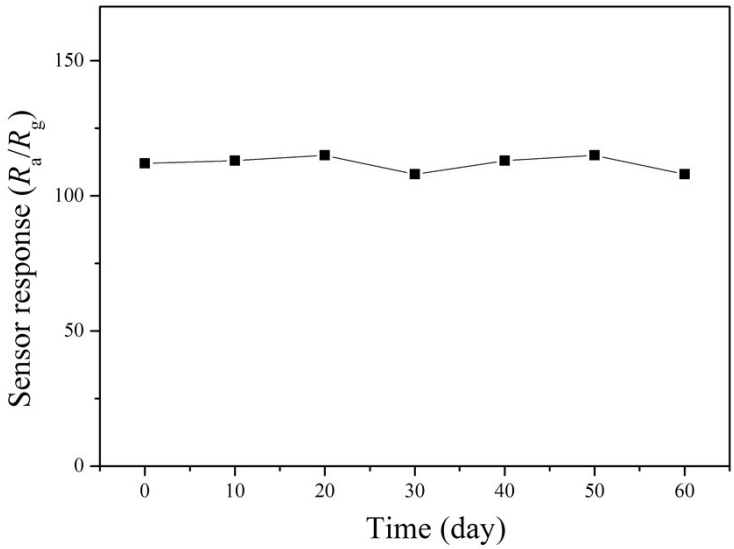

Figure S9 The long-term stability of the net-like SnO_2/ZnO heteronanostructures to 5 ppm H_2S.

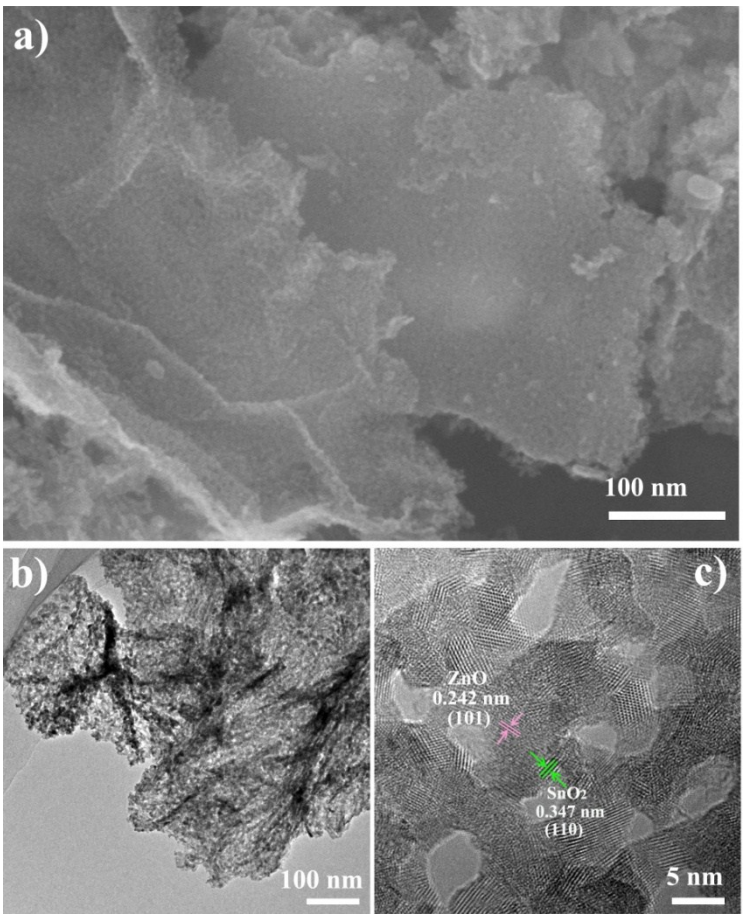

Figure S10 a) SEM, b) TEM and c) HRTEM image of the net-like SnO_2/ZnO heteronanostructures the long-term H_2S measurements.

Table S2 Comparison of H_2S sensing properties of the net-like SnO_2/ZnO heteronanostructures with other sensing materials.

Materials	H_2S concentration (ppm)	Response $S=(R_a/R_g)$	Operating temperature (◦C)	References
ZnO/G	50	7	260	[43]
SnO_2/G	1	~2.4	260	[44]
	50	126		
SnO_2@rGO	10	78	100	[45]
MoO_3/G	20	23	110	[46]
ZnO-ZnS nanorods	1	~6	Room temperature	[52]
	50	~29		
ZnO/α-Fe_2O_3	100	4	290	[47]
ZnO nanorods	10	5	190	[32]
	100	34.8		
Sb-doped SnO_2	100	56	150	[48]
Cu-doped SnO_2	10	2.6	180	[49]
	100	25.3		
CuO-loaded SnO_2	1	22.4(RH 80%)	300	[28]
Pb-SnO_2-ZnO	20	1.5	Room temperature	[33]
In_2O_3@WO_3	0.5	~12	150	[20]
	5	~70		
WO_3	5	27	390	[50]
net-like SnO_2/ZnO	0.01	2.7	100	This work
	5	112		